

# VA's James River Chlorophyll Study

In Response To  
Chesapeake Bay TMDL

---

Stakeholder Advisory Group  
Aug 27, 2012





# Chesapeake Bay TMDL

- Issued December 29, 2010
- Set Jurisdictional Allocations
  - **VA**
    - TN = 53.42 millions lbs/yr (mpy)
    - TP = 5.36 mpy
    - Sediments = 2,578.9 mpy
  - **James River Watershed (TMDL - Appendix O)**
    - TN = 23.5 mpy (2003 cap loads = 26.4 mpy)
    - TP = 2.35 mpy (2003 cap loads = 3.41 mpy)
  - **Appendix X – Staged Implementation**
- **Watershed Implementation Plan I**
  - **Study Plan for review and update of James River Site-specific Numeric Chlorophyll-a Water Quality Criteria (Appendix 2)**

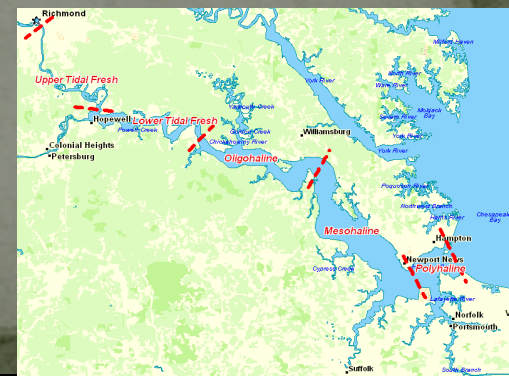
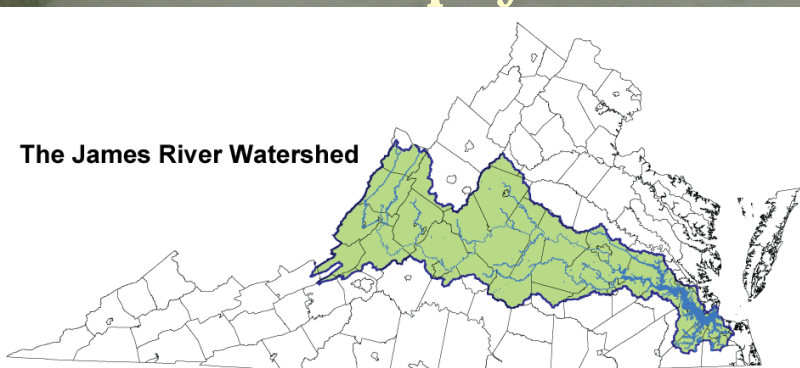


# Future Modifications to the Chesapeake Bay TMDL Section 10.3

- Based on possible updates to the model and on jurisdictions' WIPs, EPA will consider revising the Chesapeake Bay TMDL, if appropriate, in 2012 and 2017.
- EPA will also consider revising the TMDL based on other new or additional information provided by the jurisdictions.
- All revision requests from jurisdictions should be coordinated with EPA to fit within EPA's planned revision time frame.

# Study Goals

- Revisit the James River TMDL allocations (Appendix O & X, Bay TMDL)
  - Develop a site specific James River water quality model
  - Re-assess attainability of chl-a criteria
- Review and confirm/adjust James River chl-a standard (WIP I - Appendix 2)
  - Scientific Advisory Panel to make recommendations
  - Conduct scientific study to review basis for setting chlorophyll standard



# Outline

- Basis for Chlorophyll *a* Criteria – Summary of 2005 process
- Impact of EPA's TMDL Allocations
- VA WIP/Bay TMDL Process
- Current Status

# Virginia Regulations

## Existing Before 2005

- **Designated Uses** - 9 VAC 25-260-10  
“...balanced, indigenous population of aquatic life...”
- **General Criteria** - 9 VAC 25-260-20  
“...undesirable or nuisance aquatic plant life...”
- **Nutrient Enriched Waters** - 9 VAC 25-260-330  
“...undesirable growths of aquatic plant life in surface waters...”

## Adopted in 2005 for All Bay Waters

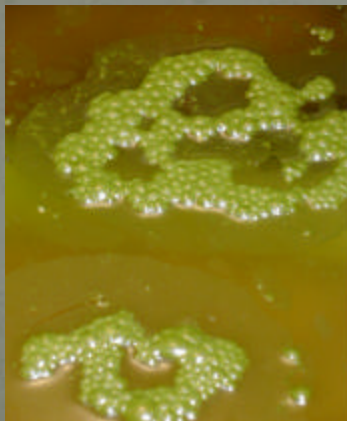
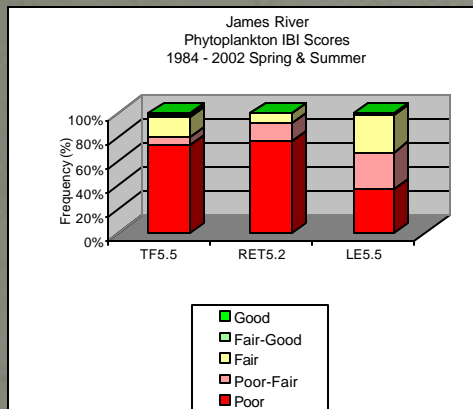
- **Narrative chlorophyll a criterion** - 9 VAC 25-260-185  
“concentrations of chlorophyll-a shall not exceed levels... undesirable... unsuitable... ecologically undesirable water conditions...”



# Need for Numeric Chlorophyll-*a* Criteria

- Tidal James River is eutrophic
- Annual algal blooms
- High and increasing levels of undesirable algae
- Unbalanced community composition
- Listed as impaired under CWA § 303
- Dissolved oxygen / water clarity criteria not driving nutrient reductions

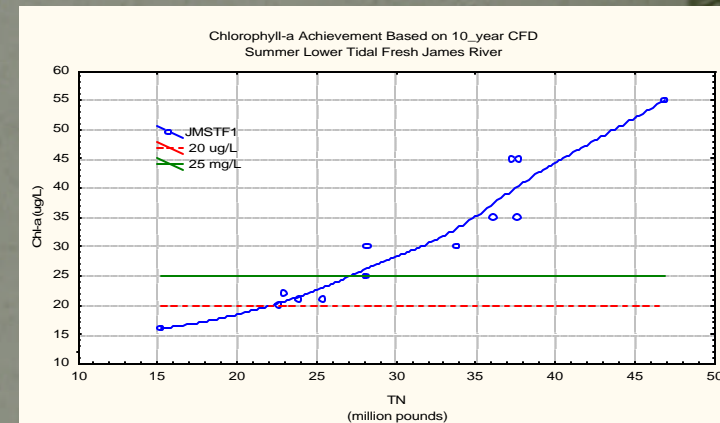
# Basis for Chlorophyll *a* Numeric Criteria

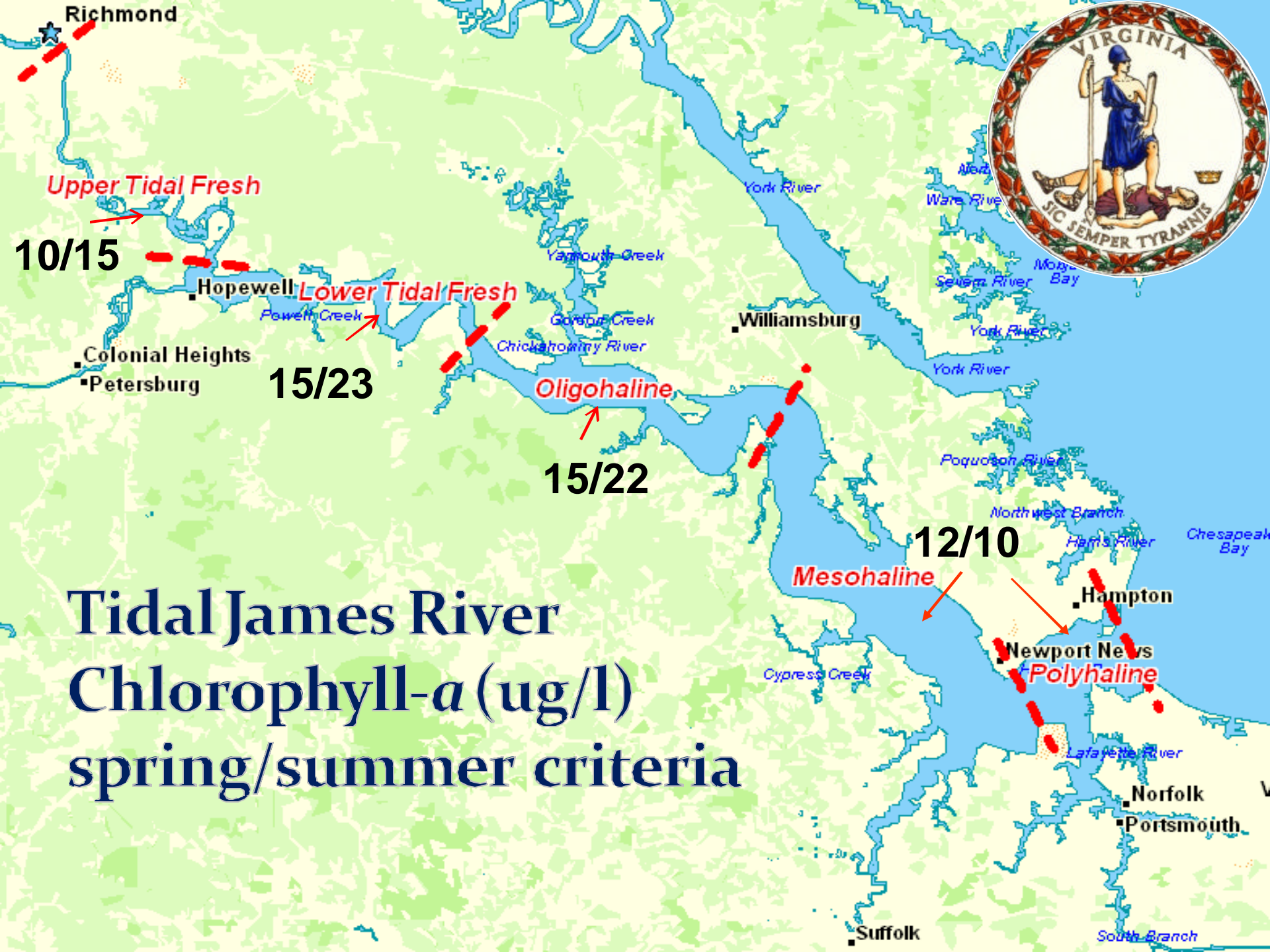


- Balance = Phytoplankton Index of Biotic Integrity (IBI), Diversity Indices
- Undesirable or nuisance aquatic plant life... = HAB, food quality issues
- Natural characteristics
- Attainability

# Attainability - Alternatives Analysis

- Alternative Loading Scenarios
- Levels of chlorophyll-a
- Attainability
- Environmental Benefits
- Modeling issues
  - Not sensitive to small loading changes
  - Calibrated seasonal averages over broad spatial and temporal domains
  - James River chlorophyll calibration highly variable





**Tidal James River**  
**Chlorophyll-*a* (ug/l)**  
**spring/summer criteria**

# Impact of EPA Chesapeake Bay TMDL Allocations

- Set nutrient load caps for all Bay river basins
- TMDL set cap much lower for James River basin than EPA approved with chlorophyll standard in 2005 (Appendix O & X)
- Impact estimated to add \$1-2 billion to nutrient reduction costs
- VA conclusion: let's make sure first

## James River Watershed TMDL

TN - 23.5 mpy (2003 cap loads = 26.4 mpy)

TP - 2.35 mpy (2003 cap loads = 3.41 mpy)

# VA WIP/Bay TMDL Process

- VA Phase I WIP – November 2010
  - Described VA concerns with allocations
  - Outlined need for study of existing chlorophyll criteria and review of modeling framework
  - Presented staged implementation approach for point source discharges in James Basin
- EPA Agreed with approach
  - Included Staged Implementation in Appendix X of Chesapeake Bay TMDL – December 2010
  - Tacit recognition that VA is reviewing chlorophyll criteria

# James River Basin Approach

## Staged Implementation

- VA Phase I WIP outlines nutrient reduction actions to achieve TMDL Implementation 60% reduction target by 2017
- VA Phase III WIP with additional reductions scheduled after 2017

## Scientific Study with Standards Review

- Conduct 3-4 year scientific study to review basis for setting chlorophyll standard & make recommendations
- Revise standard/TMDL by 2017, as appropriate

# Status: Scientific Review

- Scientific study to review basis for setting final nutrient allocations
  - VCU contracted to assist in managing study and Science Advisory Panel
- Completed detailed monitoring & modeling work plan for Year 1
  - Modeling contract (awarded 3/12)
    - Re-assess chlorophyll attainability
  - Monitoring contracts (awarded 5/12)
    - focus on algal bloom characteristics and
    - linking blooms to designated uses
- Initiate Rulemaking process –
  - Notice of Intended Regulatory Action (NOIRA)
    - Issued Sept 2011
  - Regulatory Advisory Panel (TBD)

# JR Chl-a Study Schedule

2011	Workplan Developed NOIRA issued
2012	Workplan Implementation
2012-14	Monitoring and Modeling
2015	Panel Recommendations and Assessment Review
2016	Develop Regulatory Proposal (if warranted)
2017	Regulatory Review (if necessary) Complete WIP III

[http://www.deq.virginia.gov/wqs/rule.html#James\\_ChI\\_A\\_study](http://www.deq.virginia.gov/wqs/rule.html#James_ChI_A_study)



# Questions & Discussion

Arthur Butt PhD  
VA DEQ  
(804) 698-4314  
[arthur.butt@deq.virginia.gov](mailto:arthur.butt@deq.virginia.gov)

# Modeling Project Team

## CEC

*Dave Jasinski (Project Administrator) Data management & analysis.*

## VIMS

*Roger Mann – (Project Manager) Fisheries scientist*

*Harry Wang – Hydrodynamic & Pollutant modeling*

*Jian Shen – Hydrodynamic, Water Quality, and Pollutant modeling*

*Bo Hung – Hydrodynamic & Water Quality modeling*

*Mac Sisson – GIS & Numerical modeling*

## HDR|HydroQual

*James Fitzpatrick – Water Quality Modeling*

*Andrew Thuman – Water Quality Modeling*

*Thomas Gallagher – Water Quality Modeling*

## Tetra Tech

*Andrew Parker – Hydrologic, Hydrodynamic, & Water Quality modeling*

*Peter von Lowe – Point & Non Point source pollution assessment*

*John Hamrick – EFDC Modeling*

*John Riverson – Watershed modeling*

*Sen Bai – Watershed & EFDC modeling*

## ODU

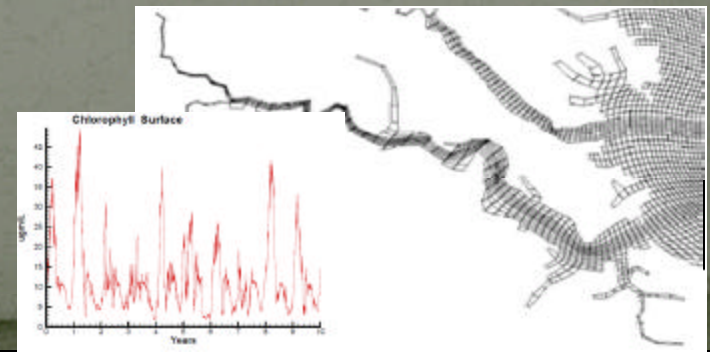
*Margaret Mulholland – HAB expert*

## UNC

*Hans Paerl – HAB/Plankton expert*

## VCU

*Paula Bukaveckas – Plankton Dynamics*



# Monitoring Project Team

- ODU
    - *Margaret Mulholland* – HAB & nutrient regeneration
    - *Harry Marshall* – Phytoplankton & HAB IDs
  - VCU
    - *Paul Bukaveckas* – Nutrient Dynamics
  - VIMS
    - *Ken Moore* – Biological data and dataflow
    - *Kim Reece & Wolf Vogelbein* – HAB /genetics , aquatic toxicology and bioassays
    - *Iris Anderson* – Nutrient regeneration and SONE
- 
- HRSD
    - Dataflow
    - Continuous monitoring



# Public Comment Received

## (in 2005)

- **Environmental** – must have numerical criteria; prefer the originally proposed criteria or close to the original criteria; no more delays.
- **Citizens** – reflect environmental comments.
- **Regulated** – concerns with scientific basis of criteria particularly in lower James; prefers upward adjustments of criteria; cost too high; benefits not clear or measurable.

# DEQ Responses / Conclusions

- Set numerical criteria in the tidal James River.
- Setting chlorophyll criteria is not as quantitatively precise as the dissolved oxygen or water quality recommendations.
- Attainability can be used to focus in on a criterion value that will remain protective of designated uses based on the available scientific findings

# Ches. Bay and Tidal Tributaries:

- Numeric Chlorophyll criteria only apply to the James River
- Criteria were met in:
  - Upper & Lower James during the spring season
  - Middle James during the summer season

